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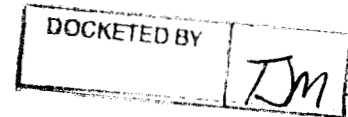
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May 9, 2012

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Arizona Corporation Commission
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MAY 09 2012



RE: Arizona Public Service Company's 2011 DSM Implementation Plan
Docket No. E-01345A-10-0219

Attached please find Arizona Public Service Company's Demand Side Management
Shade Tree Pilot Program Measurement, Evaluation, and Research Report.

If you have any questions regarding this information, please contact me at (602)250-
2661.

Sincerely,

Jeffrey W. Johnson

JJ/cd
Attachments

CC: Brian Bozzo
Candria Allen



Arizona Public Service Company

Demand Side Management Shade Tree Pilot Program

Measurement, Evaluation, and Research Report

May 2012

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1. Executive Summary

Arizona Public Service Company ("APS" or "Company") submits this measurement, evaluation and research ("MER") report for its Demand Side Management Shade Tree Pilot Program ("Shade Tree Program" or "Program") as required by Arizona Corporation Commission ("ACC" or "Commission") Decision No. 72060.

IT IS FURTHER ORDERED that the pilot program's measurement, evaluation and research report include, but not be limited to: (i) the impact of the workshops on program participation; (ii) the impact of the workshops on compliance with the program's requirements for planting; and (iii) the impact of the workshops on energy savings and cost-effectiveness. In particular, the measurement, evaluation and research report should include data regarding whether the mandatory workshops improve mortality and enhance savings sufficiently to justify the pilot's program design, or whether a larger portion of the program funding should be shifted from workshops into the rebates and incentives category, in order to provide more trees.

Navigant Consulting ("Navigant") performed measurement and verification on the Company's 2011 APS Shade Tree Program. The evaluation approach focused on assessing the energy impacts of the Program, compliance with planting requirements, and the impacts of the tree planting workshops on Program participation and cost effectiveness.

The tree planting workshop educates customers on successful tree planting and care techniques and provides customers information regarding ideal tree planting location(s) that will result in the greatest amount of customer energy savings. Navigant's evaluation found that the tree planting workshops resulted in customers being educated on tree planting and the workshops influenced compliance with planting orientation requirements and tree maintenance. Other benefits after workshop participation included customers planting additional trees using the Program requirements and taking other energy saving actions.

While the overall Program was found to be cost effective, savings levels were lower than initially expected due to planting distances. APS believes small improvements in the training in this area could improve savings results and Program cost effectiveness. Additional cost benefits were that 14% more trees were provided (over plan) at 31% less cost than the filed budget.

APS will continue to monitor other Program implementations and delivery models and will test new models and their savings results. APS will also evaluate online training to either supplement or replace the event-located training.¹

Based on the conclusions listed above, APS is continuing the Program, including the tree planting workshop element.

2. Arizona Public Service Shade Tree Program Description

The Shade Tree Program provides free shade trees to APS customers to help reduce cooling needs. Customers must attend a Shade Tree Program workshop. The tree workshop educates customers on successful tree planting and care techniques and provides a customer specific site map indicating the ideal energy efficiency (“EE”) tree planting location(s). Customers can qualify to receive between two (homes built after 1980) and three (homes built prior to 1980) free shade trees per residence. Customers must certify that they will meet and comply with Program eligibility requirements.² Program eligibility requirements are provided below:

- Must be a current APS residential single family home customer living in Maricopa County;
- Must be able to plant the trees approximately 15 feet away from the western, eastern or southern side of their home;
- Must have the legal right to plant the trees on the property;
- Must have the ability to care for the trees as needed; and
- Must attend an APS Shade Tree workshop.

The Shade Tree Program launched with its first workshop and distribution event on May 14, 2011. Two events were held in May with three workshops at each event. These first two spring events distributed 515 trees. Customers at these events attended a one hour workshop and left the event with the Program trees.

The one-hour Program workshops teach participants about home energy use, sources of heat gain, ways to reduce home heat gain, tree placement for energy savings, ideal planting zones, map consultation, Right Tree, Right Place guidelines,³ Blue Stake information and coding, how to plant, stake, mulch, water, and prune trees, tree debris disposal and tree selection.

With the goal of distributing an additional 4,485 trees before the end of the year, APS held five workshop events with two workshops per day in the summer months (July and

¹ ACC Decision No. 73089 ordered APS to initiate a pilot project in its Shade Tree Program to test the feasibility, effectiveness, and economic advantages of using online training to either supplement or replace the event-located training currently being offered by the Company.

² Customers also affirm that they are responsible for transportation, planting and maintenance of the Program trees.

³ Right Tree, Right Place guidelines are APS vegetation services published guidelines to help mitigate tree planting near power lines.

August) to provide the education to a group of customers that would return to pick up their trees in the fall. Trees were not distributed at these events due to the extreme Arizona heat and to maximize the survivability of the trees. Just over 500 customers attended these summer events and approximately 59% returned in the fall to pick up their trees.

The bulk of the tree education and distribution occurred at the six fall events held in September and October. The fall events consisted of two workshops and immediate (same day) tree distribution.

3. Program Goals, Objectives, Savings Targets and Participation

The goal of this Program is to encourage customers, through education and incentives, to plant shade trees in areas near their homes to reduce home cooling needs.

The Program goal was to distribute 5,000 trees in 2011. APS distributed 5,718 trees to Maricopa County residential customers in 2011. APS's 2011 DSM Implementation Plan,⁴ estimated that the EE savings expected to result from the Shade Tree Program could reduce peak demand annually by approximately 0.4 MW and save 18,000 MWh over the life of the measures installed in 2011.

4. Evaluation and Monitoring Activities and Results

Navigant was engaged to perform measurement and verification for the 2011 APS Shade Tree Program. The evaluation focused on assessing the energy impacts of the Program and the requirements set forth by ACC Decision No. 72060, which requested an evaluation of workshop effectiveness as well as energy savings and cost effectiveness of the Program.

Impact Analysis Methodology

Navigant assessed savings through a combined approach of on-site field verification and email surveys. Navigant completed field verification of 61 Program participant's yards. Working with Navigant, Opinion Dynamics Corporation ("ODC") surveyed 111 Program participants via email. Of the 111 Program participants surveyed via email, twenty-nine of the 61 field verified sites also received the email survey, accounting for 138 trees. Navigant also analyzed data from another 56 email surveys covering an additional 137 trees.⁵ Therefore, the analysis and results in this report include information from a total of 117 sites and 275 Program trees.

In its field verification program, Navigant focused on assessing the number of trees planted, planting distance from the house, geographic orientation with respect to the house, and tree health.

⁴ Approved in ACC Decision No. 72215.

⁵ Data from the remaining 26 email surveys was unreliable.

Sampling Plan

For field verification, Navigant developed a sample from the participant database provided by Valley Permaculture Alliance. A sample size of 64 participants was indicated for a 90/10 level of confidence and precision with an estimated coefficient of variation of 0.5.⁶ The sample of participants used for site visits was further stratified to be representative of workshop attendance numbers and geographic distribution of the population of participants. Customer availability and willingness to participate in a site visit were driving factors for the final sample.⁷

Tree Health

Navigant assessed tree health based on criteria such as trunk and leaf color, presence of scarring, rot, and/or pest infestation, and overall appearance of the tree. Field evaluators were aware that several of the tree types were in a state of dormancy and lose their leaves during the fall and winter seasons, which was when the site visits were conducted. A total of only 7% of the evaluated trees were dead, and most of those had been removed prior to Navigant's inspection. On several occasions, field evaluators noticed that participants appeared to be watering their Program trees more than the amounts recommended by the Program workshop.

5. Energy and Demand Savings Estimates

Navigant performed computer energy simulations to estimate the annual energy and demand savings for the Shade Tree Program. The savings estimates were based on DOE-2⁸ simulations using the Home Performance with ENERGY STAR[®] baseline models for Phoenix. The simulations and savings estimates account for shading to the participants' homes as well as shading to neighboring houses by the Program trees. Navigant ran two model simulations for each of the 106 verification and email survey sites that had surviving trees. Simulations were not run for the remaining 11 sites that had trees that were dead or not planted. Model inputs included the verified number of trees, tree orientation, and tree distance from the house. Navigant performed a model run for each site using tree sizes representative of half-mature trees, and fully-matured trees. Yearly savings estimates were determined by interpolating between the two model outputs to simulate an appropriate tree growth rate. Finally, Navigant applied a mortality curve from the U.S. Forest Service's "Desert Southwest Community Tree Guide,"⁹ which was modified to include a first-year mortality rate equal to that discovered during field verification.

Based on the research above, the average annual energy savings is 74 kWh per year for each tree. In total, about 86% of the assessed trees contributed to energy and demand

⁶ Navigant ultimately assessed a total of 117 participants via site visits and email surveys.

⁷ Final results are weighted according to the number of delivered trees for May, Summer, and Fall workshops.

⁸ DOE-2 is a public software program that performs advanced building energy simulations, and can be found at: <http://doe2.com/>.

⁹ Accessed February, 2012 at:

http://www.fs.fed.us/psw/programs/uesd/uep/products/cufr542_72dpiDsrtSWCommTreeGd04.pdf.

savings. About 48% of the trees assessed were both healthy and planted according to the Program guidelines outlined in the workshop curriculum. Of the remaining 52%, most trees were planted in the proper orientation, but at distances farther than the suggested 15 feet. Since orientation drives savings more than distance from the home, the evaluation team assessed savings for all surviving trees, including those planted outside Program requirements. Trees found to be dead or not planted received zero savings.

Table 1 and Table 2 show a summary of Program results for this round of verification. All savings estimates represent a weighted average for verification results of participants from spring, summer, and fall workshops, based on the number of delivered trees. It is important to note that there was a 1-2 month time lag between when summer participants attended the workshop and when they picked up their trees.

**Table 1: Verification Results
2011 APS Shade Tree Program**

Verification Results	
Total sites assessed¹	117
Total trees assessed²	275
Percentage of trees meeting all workshop planting guidelines³	48%
Percentage of trees that generated energy and demand savings⁴	86%
2011 Program-level energy savings (MWh)⁵	423
2011 Program-level peak demand savings (MW)⁵	0.4
2011 Program-level coincident demand savings (MW)⁵	0.2
Lifetime energy savings (MWh)⁶	12,679
Benefit/Cost ratio	1.6

1. The total sites assessed include 61 sites verified by Navigant site visits and 56 verified by ODC email surveys.
2. Navigant site visits verified 138 trees and ODC email surveys verified 137 trees.
3. Guidelines include criteria for tree health, distance from home, and orientation with respect to home.
4. Navigant assigned energy savings to all surviving planted trees regardless of meeting Program criteria for distance and orientation. Inherently, trees planted farther away or at north orientation contributed reduced savings.
5. Using a total of 5,718 delivered trees, as verified by the delivery invoices.
6. This assumes a 30-year lifetime for Program trees.

**Table 2: Energy and Demand Savings
2011 APS Shade Tree Program**

Energy and Demand Savings	Per Tree	Per Participant¹
Annual energy savings (kWh)²	74	166
Annual peak demand savings (kW)³	0.07	0.16
Annual coincident peak demand savings (kW)⁴	0.04	0.08

1. This column refers to the average savings per Shade Tree Program participant given that each participant planted an average of 2.25 Program trees.
2. This represents the average value of annual energy savings over the 30-year lifespan of the trees, which incorporates tree growth and mortality rates. The average savings per tree when trees are full grown is 140 kWh per year.
3. This represents the average value of peak demand savings over the 30-year lifespan of the trees, which incorporates tree growth and mortality rates. The average savings per tree when trees are full grown is 0.13 kW.
4. This represents the average value of coincident demand savings over the 30-year lifespan of the trees, which incorporates tree growth and mortality rates. The average savings per tree when trees are full grown is 0.07 kW.

6. Impacts of Workshops on Program Compliance for Planting

Table 3 summarizes the findings of field verification. In total, 48% of all Program trees were both healthy and planted according to the guidelines of the Program workshop curriculum. Another 38% of the verified trees were in good health, but were not planted according to Program guidelines. Although 38% did not meet the exact Program recommendations for planting, they still contributed to energy and demand savings. Therefore, a total of 86% of evaluated trees contributed to energy and demand savings.

**Table 3: Summary of Findings for Assessed Trees
2011 APS Shade Tree Program**

Tree Assessment									
	Spring		Summer		Fall		Total		
Tree Status	#	%	#	%	#	%	#	%	Notes
Planted according to Program guidelines	36	49%	23	58%	74	46%	133	48%	Met requirements for distance, orientation and health
Planted, but not according to Program guidelines	20	27%	16	40%	68	42%	104	38%	Trees met orientation and health requirements but were planted more than 15 feet from home
Dead/removed	13	18%	1	3%	13	8%	27	10%	Participants removed most dead trees prior to inspection
Not planted	5	7%	0	0%	6	4%	11	4%	Still in pots or given away
Total	74	100	40	100	161	100	275	100	

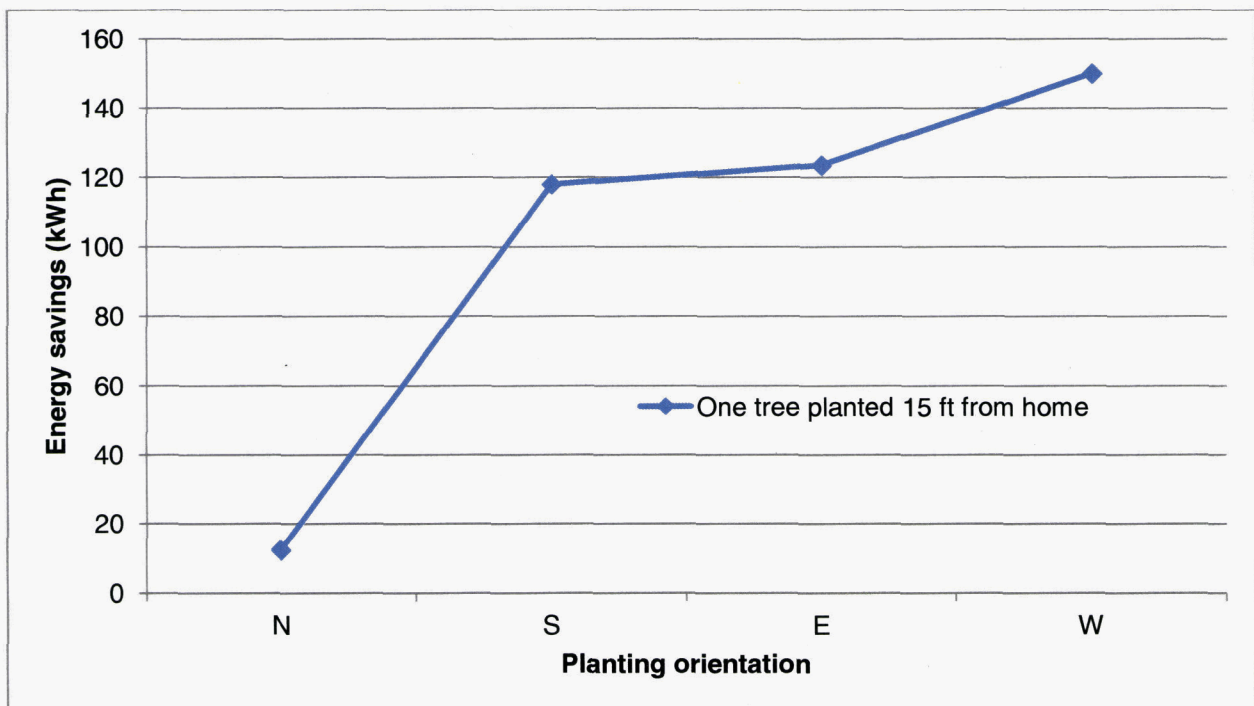
The primary reason for trees not meeting Program guidelines was a planting distance greater than 15 feet from the home. Only 9 of the 237¹⁰ trees assessed (~4%) were planted on the north side of the home, whereas 95 of the 237 (40%) were planted greater than 15 feet from the home. Simulations show that planting orientation drives energy savings more so than planting distance, and the Program was very effective at achieving proper orientation. Figure 1 shows the simulation results of how energy savings decreases with planting distance for a single tree planted on the south side of the home. Figure 2 shows the simulation results of how energy savings changes with planting orientation for a single tree planted 15 feet from the home.

¹⁰ A total of 275 trees were assessed by Navigant site visits and ODC email surveys. Thirty-eight of the 275 trees were dead or had not been planted. Thus, health, orientation and distance were only assessed for the 237 surviving, planted trees.

Figure 1: Effect of planting distance on energy savings for a single tree with south orientation.



Figure 2: Effect of planting orientation on energy savings for a single tree when 15 feet from the home.



Customers who responded to the email survey indicated that they planted an additional 41 trees according to the guidelines they had learned during the workshops. Several of these participants also received a site visit, and the verified planting of extra trees was found to be inconsistent with the reported numbers. Navigant assumes that the additional savings associated with extra trees is captured in the net-to-gross assumption of 1.0. Additionally, no free ridership analysis was conducted, so it would be inconsistent to add the effects of spillover (extra trees).

Figure 3 and Figure 4 show the respective distributions of orientation and planting distance for all verified trees. Program participants planted the majority of trees between 5-20 feet from the house, and on the west, south, or east side.

Figure 3: Distribution of verified tree orientation with respect to home.

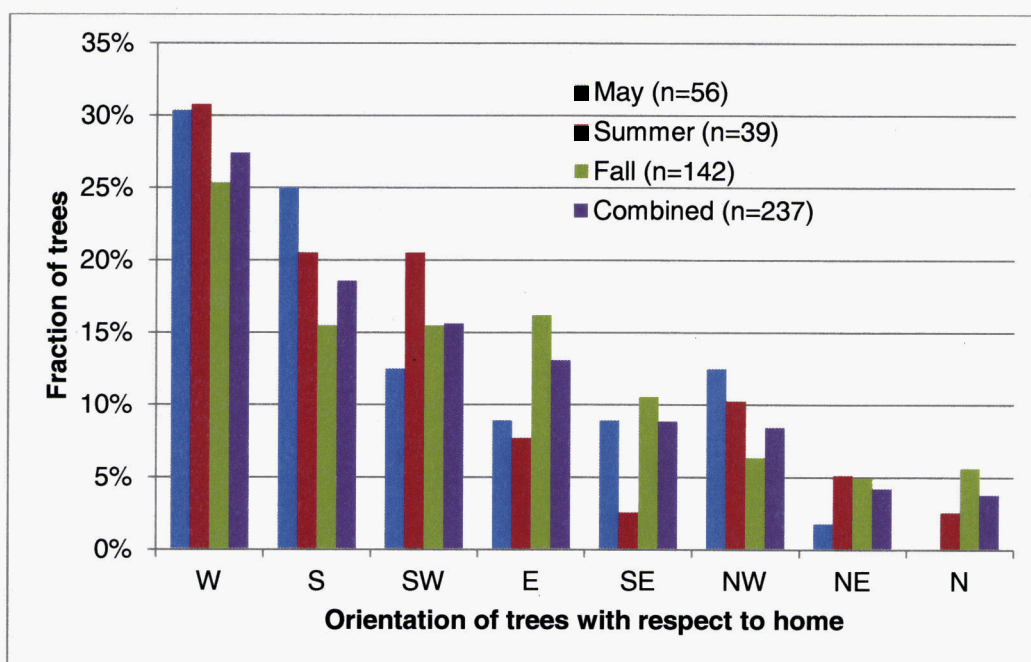


Figure 4: Distribution of planting distance from home for verified trees.

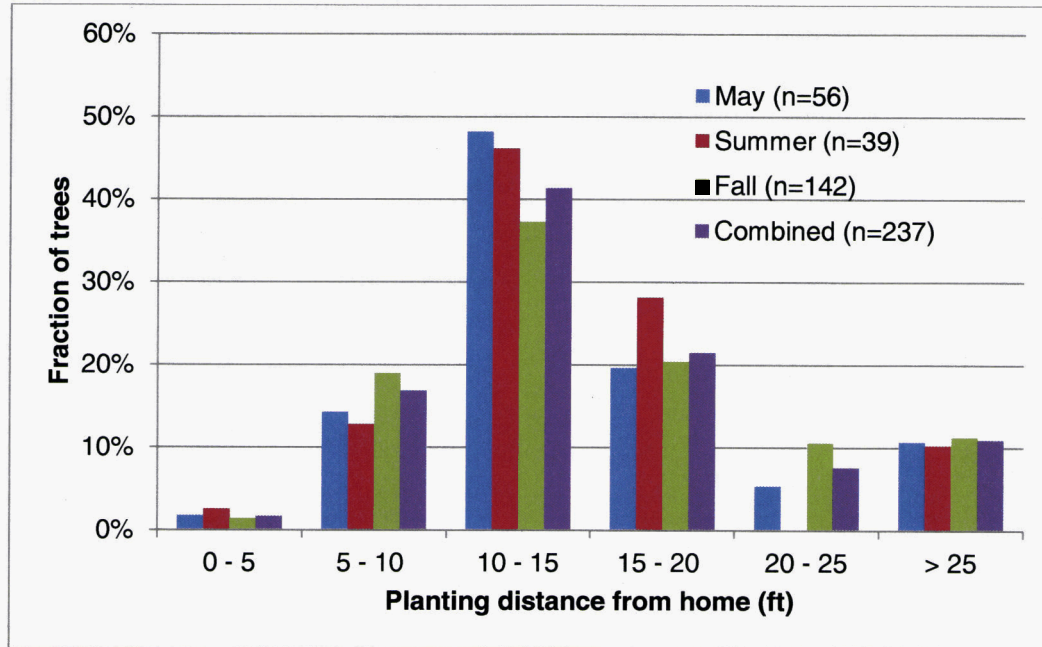


Table 4 summarizes the statistics for tree distance for all verified trees. Customers consistently met the Program requirements regarding orientation and health. Customers planted a majority of trees on the correct side of the home for energy savings. Approximately, one-third of customers planted trees more than 15 feet from their home. Table 4 illustrates the mean and median planting distances. Going forward APS will revise its Program workshops in an effort to improve compliance with planting distance requirements.

**Table 4: Statistics for Tree Distance
2011 APS Shade Tree Program**

Statistics for Tree Distance	Spring (n=56)	Summer (n=39)	Fall (n=142)	Combined (n=237)
Mean distance from house	16.8 ft	16.1 ft	17.0 ft	16.8 ft
Median distance from house	15.0 ft	15.0 ft	15.0 ft	15.0 ft

n = sample size.

7. Impact of Workshops on Energy Savings and Cost-Effectiveness

The 2011 approved Program budget was \$444,000 to deliver 5,000 trees. In 2011, APS delivered 5,718 trees for \$306,363 for a cost savings of 31% and 14% increase in trees distributed. The 2011 cost savings were a direct result of:

- Reduced marketing needs. The demand for the Program was generated using low cost and no cost marketing methods.

- Partnerships. There were a number of sites that provided free or reduced facility and equipment rentals to host these events. Without these partnerships, event costs would have been significantly more expensive.
- Volunteer labor. Ninety-five percent of the labor working each event was volunteer labor. Many different volunteer groups were eager to help educate customers and distribute shade trees.
- Tree cost. It was estimated that the trees would cost up to \$10 per tree. APS was able to purchase the Program trees for \$7.50 per tree or \$7.68 per tree when factoring in delivery costs to events. This tree savings allowed us to deliver 718 more trees than planned without increasing the budget for incentives.

These substantial cost savings will guide future plan budgets. Information about the costs incurred for this Program during 2011 is listed in Table 5 below:

Table 5: 2011 APS Shade Tree Program Costs

DSM Program	Incentives	Training & Technical Assistance	Consumer Education	Program Implementation	Program Marketing	Planning & Admin.	Program Total Cost
Shade Trees	\$43,948	\$0	\$244	\$239,323	\$12,872	\$9,976	\$306,363

DSM Program	Implementation (Contractor)	Implementation (APS)	Program Implementation
Shade Trees	\$188,633	\$50,690	\$239,323

The Shade Tree Program is cost-effective in the pilot year, and there is potential for increased cost-effectiveness with improved planting compliance. The total Program costs and benefits are shown in Table 6. The top tier category indicates the benefit/cost potential that could be reached if all Program participants planted the trees similar to the top 1/3 of verified participants (with respect to per-tree energy savings).

Table 6: Shade Tree Cost Effectiveness

Cost Effectiveness	Verified	Top Tier (potential)
Total benefits to date	\$1,328,184	\$1,935,968
Total costs to date	\$845,863	\$845,863
Net benefits	\$482,321	\$1,090,105
Societal cost test ratio	1.6	2.3

Navigant believes the Program workshops were very effective at achieving energy savings. DOE-2 model simulations indicate that tree orientation drives energy and demand savings more so than planting distance, and the small (~4%) instance of north

orientation is a clear indicator of workshop effectiveness. Several participants indicated that they had learned the proper orientation and planting distance during the workshops. However, energy savings was not always the motivating factor. Several participants also noted that they selected planting location for aesthetics, to shade an unconditioned patio, or block the view of neighbors.

Navigant performed analyses to highlight the additional energy and demand savings that APS could achieve with increased customer compliance to workshop planting requirements. The evaluation team ranked the per-tree energy savings from highest to lowest, and divided the verification sites into three tiers: the highest one-third savings (top tier), the middle one-third savings (middle tier), and the lower one-third savings (bottom tier). The top tier was made up of participant sites where trees were planted on the west, south, or east side of the home, at an average distance of 13.8 feet from the home. The bottom tier consisted of participant sites with trees planted on the north side of the home and/or far away from the home. Table 7 displays the potential increase in savings from increased compliance. If all Program participants achieved top tier savings, the per-tree energy savings could increase from 74 kWh/year to 97 kWh/year, representing a 31% gain in savings. Even greater savings could be realized for peak demand savings. The benefit/cost ratio would increase to 2.3.

Table 7: Potential Gain in Energy and Demand Savings

	Verified Average	Top Tier Average	Potential Gain in Savings
Annual energy savings per tree (kWh)	74	97	31%
Peak demand savings per tree (kW)	0.07	0.011	61%
Coincident peak demand savings per tree (kW)	0.04	0.06	59%
Benefit/Cost ratio	1.6	2.3	46%

8. Additional Program Benefits

There are a number of important Program benefits that are not factored into the cost benefit analysis. A summary of these benefits is provided below:

- The Program is available at no cost to customers and this is a valuable EE resource for limited income customers. A number of energy conscience customers in dire financial situations participated in the Program. Additionally, the Program is available to many of APS's residential Maricopa County customers.
- Many of the Phoenix metropolitan cities have aggressive tree canopy reforestation goals. This Program provided trees to residents in these cities at no additional cost to the municipality or customer. In helping the municipalities meet their tree canopy goals, together we can work reduce the urban heat island effect.

- The workshops provided tree care and maintenance tips that most customers did not know prior to attending. Many customers exiting the workshops commented about how the Program would help them maintain their current trees as well as the new, Program trees. By providing this additional education to customers, it is likely that customers will care for their existing trees using this new knowledge and therefore increase tree survivability.
- An Ask the Expert station is available at each event where customers may receive additional expert advice on any number of landscape topics. This station stays open with tree and garden experts available until all customers have had their questions answered.
- The trees add aesthetic appeal and value to the home. The USDA Forest Service states that “Healthy, mature trees add an average of 10 percent to a property’s value.”¹¹
- By planting desert adapted trees in proper locations and utilizing proper pruning, shade trees can modify climate and conserve building energy in three ways.¹²
 - Shading reduces the amount of radiant energy absorbed and stored by built surfaces.
 - Transpiration, the passage of water through a tree from the root system into the atmosphere, which cools the surrounding air.
 - Wind speed reduction reduces the infiltration of outside air into interior spaces.
- The Program provides a number of positive impacts on the environment and community. These impacts include:¹³
 - Reduction in storm water runoff;
 - Reduction in sulfur dioxide, nitrogen dioxide, ozone, carbon dioxide, and particulate matter in the atmosphere;
 - Sequestration of carbon dioxide;
 - Benefit for indigenous wildlife; and
 - Neighborhood and community beautification.
- Participants reported taking other important energy saving actions after attending the shade tree workshop, including the following:
 - 32% changed thermostat settings;
 - 28% turned off lights more; and
 - 24% used shades, blinds or curtains to control temperature.

¹¹ <http://www.arborday.org/trees/benefits.cfm>

¹² Desert Southwest Community Tree Guide: Benefits, Cost, and Strategic Planting, July, 2004, McPherson, Gregory.

¹³ Phoenix Green: Designing a Community Tree Planting Program for Phoenix, AZ, 2009, Western Resource Advocates.

9. Do the Mandatory Workshops Improve Mortality and Enhance Savings Sufficiently and Should a Larger Portion of the Program's Funding be Shifted from Workshops into Rebates and Incentives?

Navigant was unable to directly discern the impact of the workshops alone on tree mortality and savings, due to lack of a proper comparison group that does not include workshops, utilizes a similar deployment model, and is currently in a pilot phase. Navigant did find that the societal cost ratio of 1.6 for APS is almost exactly the same as the PY2011 for Tucson Electric Power's non-workshop based "Trees for Tucson" program.¹⁴

Navigant also found that mortality studies would need to be conducted over a longer time frame to fully determine the mortality rate of this Program design as compared to other delivery models. APS is unable to definitively determine the workshops impact on tree mortality at this time, but workshop antidotal evidence revealed that customers routinely commented on their increased knowledge of how to maintain and care for their current and new trees for many years to come after exiting the workshop sessions. If practiced correctly, the maintenance and care techniques should decrease tree mortality.

At this time, APS does not believe funding should be shifted from workshops into rebates and incentives. As described below, workshops are important to the success of the Program. APS will continue to monitor other Program implementation and delivery models, and will test new models and their savings results. Consistent with the Commission's recent decision approving APS's 2012 DSM Implementation Plan, APS will also evaluate an online training program to either supplement or replace the event-located training.¹⁵ Should APS recommend changes to the existing Program, it will file those changes for Commission approval in its Demand Side Management Implementation Plans submitted to the Commission annually on June 1st.

10. Impact of the Workshops on Program Participation

The workshop requirement of this Program design does not appear to be a barrier to customer participation. The demand for the Program was extremely high and all fall workshops were filled to capacity. To maximize customer convenience, APS instituted an email notification list that customers could join to be notified when new Program events were available for registration. At the end of 2011, close to 1,100 customers had requested to be notified when new events were available in 2012.

In addition, customers rated the Program very highly. Customers participating in the workshops were asked to complete a workshop evaluation form. Of the 1,609 customers

¹⁴ Based on \$992,597 in Societal Benefits and \$603,337 in Societal Costs, as stated in Table 4 of Tucson Electric Power Company's Annual DSM Progress Report: January-December 2011.

¹⁵ ACC Decision No. 73089, ordered APS to initiate a pilot project in its Shade Tree Program to test the feasibility, effectiveness, and economic advantages of using an online training program to either supplement or replace the event-located training currently being used by the Company to train program participants in properly locating, planting, and caring for shade trees.

who completed the evaluation forms in 2011, 93.2% rated the workshop an eight, nine or ten on a ten point scale. Using the same scale, 93.4% of the workshop participants reported they would “recommend this workshop to a friend or colleague.” These extremely high customer ratings suggest that customers valued the workshops and they should be continued.

11. Comparison to 2011 Filed Plan

Table 8 provides information on how the 2011 actual results compare to the 2011 filed plan.

Table 8: 2011 Comparison

	2011 Plan	2011 Actual
Total Program savings per tree	120	74
Number of trees	5,000	5,718
Percentage of trees planted within 15 feet	100%	60%
Percentage of trees planted with the correct orientation	100%	96%
Cost	\$444,000	\$306,363
Benefit/Cost ratio	1.6	1.6

12. Program Enhancements

There were no problems encountered with implementation in 2011. There were, however, a number of enhancements that were made throughout the year and additional enhancements have been implemented in 2012. The enhancements listed below are based upon feedback received from participants, instructors, volunteers, staff and third party evaluators.

After the spring events, a number of Program enhancements and efficiencies were implemented. APS implemented the following:

- A better customer event flow;
- Updates to the curriculum to streamline it and make it easier to understand;
- Formalized routine event plans and technology checks;
- Developed small coding projects to automate the customer site map generation and customer verification;
- Provided additional instructor training;
- Reduced the daily event offering from three workshops to two to minimize event costs;
- Added additional tree signage; and
- Sent reminder emails to registered attendees and other small improvements.

After receiving the MER results and upon review of all aspects of the 2011 Program implementation, additional enhancements were instituted and will be implemented in the 2012 Program. Those include:

- Enhanced curriculum to include an additional emphasis on energy efficiency, placement (orientation and distance to conditioned space), watering and tree dormancy. Special emphasis will be placed on the importance of planting trees within 15 feet of conditioned space to improve 2011 distance to home numbers and savings.
- Provided additional teacher/trainer and “Ask the Expert” staff training to further educate the tree experts on the energy efficiency components. Customers can ask any number of questions of the experts at the “Ask the Expert” station at each event. Additional training will be provided to the experts to ensure that they are educated about, and comfortable with, the energy savings component of the Program so that they can reinforce the Program requirements in the individual consulting sessions.
- Developed specific registration confirmations and reminder emails to better prepare customers for the event. The confirmation and emails include information on the different tree types being offered, as well as, tips on homeowner association regulations and Blue Stake orders.
- Added five basic prequalification questions prior to customer event registration to emphasize Program requirements.
- Reduced the number of tree offerings. In 2011 eight trees were offered. Of the eight trees, two trees were not popular with customers. Reducing the tree offerings streamlines the Program by easing grower complexity and training, and reduces customer confusion on the differences between tree varieties. The trees offered in 2012 are the 2011 most popular tree selections.
- Designed and purchased a barcoding system that will enable APS to better track customers through the process, obtain additional data for Program management decisions and reduce the manual data entry process after each event while increasing data integrity and accuracy.
- After the first events in the spring of 2012, the enhancements listed above will be evaluated to determine their impact on the Program.

13. Plans for Expansion

Any plans for expansion of this Program will be detailed in the Company’s DSM Implementation Plan filing submitted to the Commission for approval annually on June 1st.

14. Conclusion

A detailed MER evaluation of the APS Shade Tree Program was completed for the first year of implementation. As part of that evaluation, Navigant looked at several factors evaluating the impacts of the tree planting workshops on Program effectiveness. Based on the MER evaluation and customer feedback, the workshops have proven to influence planting orientation requirements and maintenance of the trees. With small changes to the Program's curriculum and training, compliance with planting distance requirements can be improved, which will enhance the cost benefit test for this Program.

Based on this MER, the Program is cost effective and will be continued. Savings levels were lower than initially expected due to planting location distances. APS believes small improvements in training in this area could improve savings results and Program cost effectiveness. Additionally 14% more trees were provided (over plan) at 31% less cost than the filed budget. In addition to the cost and energy savings benefits from this Program, there are other ancillary benefits from this Program at the customer and community levels.

APS will continue to monitor other Program implementations and delivery models and will test new models and their savings results. APS will also evaluate using an online training program to either supplement or replace the event-located training.

Based on the conclusions listed above, APS is continuing this cost effective Program, including the tree planting workshop element. APS will continue to explore Program improvements that will increase the cost effectiveness and cost benefit ratio of the Program.

Appendix A

Other Relevant APS Shade Tree Program Information

1. *Curriculum Approval*

The shade tree workshop curriculum development was vetted with local arborists with the following designations:

- International Society of Arboriculture (“ISA”) Certified Arborist
- ISA Certified Arborist/Utility Specialist
- ISA Certified Arborist/Municipal Specialist

2. *Program Marketing Efforts*

Due to customer interest and demand for this Program, aggressive Program marketing was not needed or implemented. Mindful of the Program budget, the following low cost Program marketing efforts during the year were deployed:

- Flyer distributed at local events and communities.
- aps.com.
- Call Center referrals.
- Page 2 bill message for targeted zip codes surrounding the spring workshop locations.
- Contractor messaging to their member groups.
- Local area sustainability Program newsletter publications.
- Local neighborhood association newsletters.
- Press release to west valley small market newspapers.
- Poster at the workshop location.
- Page 1 bill message for metro Phoenix zip codes.
- Targeted direct mail campaign to limited income customers.
- Flyers sent home with students of Academia Del Pueblo (event site).
- Short video segment on Cronkite News.

3. *Additional Program Materials*

Each participant receives the following materials in an educational workshop packet including:

- Aerial photo of his/her home with the ideal EE planting locations highlighted.
- Program participation form
- Workshop evaluation form
- Blue Stake Guide
- Right Tree, Right Place brochure
- Detailed watering guide published by the Arizona Municipal Water Users Association
- In addition to the materials listed above, additional resources, including a copy of the curriculum, tree information and helpful links are provided on aps.com.